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ACCOUNT OF A CASE
OF
SUICIDAL POISONING
BY MEANS OF
CONCENTRATED SULPHURIC ACID.

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DANIEL MACLEAN, aged 49, was admitted into the Royal Infirmary, about half-past ten on Tuesday the 18th of February 1840, under the following circumstances.

In early life he had been in the United States of America, where he pursued the profession of a teacher with considerable success, so as to maintain himself in a state of comfort and respectability, and even to save some money. With this he returned, in 1823, to this country, and commenced business at Leith as a dairy-keeper, but, not being very successful, he entered, in 1825, into the service of a respectable druggist and manufacturing chemist, where he continued to the present time, a period of at least fifteen years. During the whole of this long period, he is represented by the gentleman by whom he was employed to have conducted himself with the greatest steadiness and propriety, to have been habitually sober, temperate, and regular, and to be a person in whose honesty and integrity the strictest confidence could be reposed. His duties were various; and for several years past he has been chiefly occupied in the manufacture of soda-water upon the large scale, in the preparation of which sulphuric acid is poured on chalk, in order to extricate carbonic acid gas.

Several weeks ago, he betrayed symptoms of great despondency and lowness of spirits, with some anxiety about the condition of his soul, and, upon one occasion, he expressed to his master his belief that he had done something to peril, if not to ruin his soul. His conduct, however, was always perfectly correct in a moral and

religious point of view, excepting that he ceased to go to church or attend divine service in public. In various other matters also, he was observed by his wife to act in a singular and eccentric manner. He continued frequently gloomy and despondent, occasionally confused and void of recollection. On Saturday the 8th of February, it was ascertained that he swallowed, with the manifest intention of destroying himself, two drachms of laudanum and six grains of opium. These produced little effect beyond considerable drowsiness, and, after the use of two doses of sulphate of zinc, (one scruple in each,) with some mustard infusion, which was followed by vomiting, he completely recovered.

During the last two days his despondency seemed abated so much as to remove all suspicions of his intention of attempting suicide. On the morning of Tuesday, the 18th of February, however, about twenty minutes before ten o'clock, he was found lying on the floor, and near him a small four ounce jar, from which it was ascertained that he had taken at least two ounces of sulphuric acid, of sp. gr. 1840.

It was ascertained that the acid must have been swallowed about seven or eight minutes after nine o'clock, so that he must have had it in the stomach at least half an hour before he was seen.

One of the gentlemen in the establishment immediately gave him some magnesia suspended in water, and of this he swallowed a considerable quantity.

The medical gentleman who was requested to visit him, and saw him about ten minutes after ten, recommended magnesia to be given very frequently. He continued, however, much in the same state, with rapidly increasing weakness. At 11 o'clock, he was brought to the Royal Infirmary, and presented the following appearance. The countenance was pale, dingy, and death-like; the surface of the body cold and clammy; the feet and forehead perfectly cold; the eyes fixed, and with the pupils slightly contracted, but not very sensible to light; the pulse was exceedingly small, 64 in the minute; and the respiration 36, heaving, and with violent spasmodic motion of the muscles of the neck, and depression of the lower jaw at each inspiration, so as to form a sort of gasping motion. At the same time the muscles of the abdomen were hard and rigid; and when the abdomen was pressed, he gave indistinct indications of pain; he was observed also to place his hand on the pit of the stomach, with an expression of suffering and anguish.

The mouth, lips, tongue, and fauces, were white and slightly excoriated. There was no vomiting.

On his admission he was barely able to articulate his name and age, and to all other questions he was mute, and never spoke after; but was able to swallow, and took a large quantity of magnesia and chalk suspended in water. Soon afterwards the œsophagus tube

was introduced, and the stomach pump attached, and a considerable quantity of water injected, and immediately afterwards the contents of the stomach were extracted by the pump. These were found to be deeply tinged with blood, but did not affect the colour of litmus-paper. A little after he was ordered some wine, which he swallowed, and some magnesia suspended in water. The pulse at this time, *i. e.* half-past 12 o'clock, was 56 in the minute, extremely feeble. The respiration was 20, still performed in the same laborious manner, with spasmodic motion of the muscles of the neck, and gasping depression of the lower jaw at each inspiration. In this state he continued about fifteen or twenty minutes longer; and at ten minutes before one o'clock he ceased to breathe.

The body was inspected twenty-four hours after death, on Wednesday, the 19th of February 1840, and presented the following appearances.

Upon opening the cavity of the abdomen a quantity of dark-coloured turbid serous fluid was found, amounting to at least one pound. This tinged instantaneously red litmus-paper, and the peritoneum in like manner, both over the stomach, liver, and intestinal tube, imparted a red colour to litmus-paper the moment the membrane was touched. The whole of the peritoneal coat of the stomach and the transverse arch of the colon was of a dark blue colour, as also that of the liver, spleen, and upper part of the intestines. The intestines were a good deal contracted and shrunk and their peritoneal surface seemed slightly roughened. The peritoneal covering of the diaphragm gave immediately a red tint to litmus-paper; the diaphragmatic pleura tinged litmus-paper more feebly.

The pericardium contained a dark-coloured turbid fluid, and both this and the surface of the pericardium reddened litmus-paper very feebly. The tongue, œsophagus, and larynx, with the stomach and duodenum, were removed in connection, and a longitudinal incision was then carried down the œsophagus and through the stomach, along its posterior surface, between the great and small arch. It was found to contain between two pounds and a-half and three pounds of a dark bloody coloured fluid, with masses of soft chalky matter. Upon removing this and washing it the following appearances were recognized.

The mucous epidermis of the uvula, pharynx, and tongue, was whitened, opaque, shrivelled into folds, indurated, and coming off in shreds and patches. In the lateral parts of the pharynx especially, the mucous epidermis was completely detached from the mucous corion, and lay in the form of a loose opaque membrane over it. The same was observed in the mucous membranes covering the *cornua* of the *os hyoides*, the posterior part of the thyroid cartilage, and the *epiglottis*.

The mucous epidermis of the œsophagus was in like manner

opaque, shrivelled, corrugated, in longitudinal folds, and in some parts it was peeling off from the mucous membrane of the œsophagus. The lower end of this epidermis at the cardia presented its fringed appearance, and each partition was separated from the adjoining one,—exposing intermediate spaces of the denuded mucous membrane.

The mucous membrane of the stomach was throughout of a dark-red and brown colour. That in the immediate vicinity of the cardia, especially at the anterior part of the stomach, presented an extensive patch of a dark-brown or black colour, much roughened, indurated, and prominent. Similar indurated, dark-brown, and elevated patches were formed in the cardiac portion of the stomach in its posterior wall; but they were less extensive than those in the anterior part. Similar patches were found on the mucous membrane of the anterior part of the stomach, near the large arch. The only part of the stomach totally free from these dark-coloured, indurated, elevated patches, was a small portion of the cardiac region, and the greater part of the pyloric; but the whole of the membrane was roughened, and the substance of the stomach, especially the muscular coat, was thickened, indurated, and shrunk. The pyloric region of the stomach was much thickened and indurated, and its mucous surface was covered with a quantity of rough opaque membranous matter in shreds and patches, which, upon careful examination, proved to be the mucous membrane altered and indurated by the action of the acid, and detached from the submucous membrane which was thus exposed.

The duodenum was much contracted, and its coats were thickened. Its mucous membrane was of a deep brownish yellow colour, considerably roughened, and in various points coming off from the submucous tissue.

The ileum and the whole of the small intestines were more or less contracted; their mucous membrane, in general, was of a bluish gray colour, contracted, thickened, but not eroded; the mucous membrane became of a more natural colour as it approached the lower end of the ileum; and the mucous membrane of the cœcum and the ascending arch of the colon were nearly natural.

In the transverse arch of the colon, however, the mucous membrane, especially where it was contiguous to the stomach, was thickened, indurated, red, and roughened.

The vessels of the stomach, the coronary artery, the *gastro-epiploica dextra* and the *gastro-epiploica sinistra* and their branches were distended with solid coagula of blood, which was very much darkened, and when removed resembled masses of injection. The superior mesenteric arteries were found near their trunks in the same state; and even the arteries of the omentum and mesentery generally were all distended with solid, firm, dark-coloured coagula, exactly as if they had been injected after death.



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No perforation of the stomach was found, notwithstanding the most careful examination of the organ, both before and after its removal from the body.

The whole of the lower and anterior margin of the liver was of a dirty blackish colour, extremely hard, friable, and inflexible, as if it had been par-boiled, and this change in consistency and appearance, penetrated at the lower margin of the liver, where the organ was thinnest, about a quarter of an inch into the liver. In the thicker part of the gland, it penetrated to the depth of about from one to two lines.

The peritoneal coat of the spleen was of the same dirty brownish colour, and was in like manner very much indurated. Where the organ was denuded, however, it was soft, and after some exposure to the air was slightly reddened.

The lungs were perfectly healthy, and free from adhesions.

The heart was also healthy; but the blood contained in it, and the large vessels was remarkably fluid. The valves of the heart were perfectly healthy.

The kidneys were in their cortical matter of a considerably lighter colour than natural, being of a sort of fawn colour; and the striated texture of the cortical portion had partly disappeared, and was succeeded by a granular appearance.

The arachnoid membrane and *pia mater*, especially over the hemispheres, and on each side of the falx, were much thickened and very opaque, in consequence of sero-albuminous fluid effused into the sub-arachnoid tissue, and the convolutions were depressed and atrophied by the thickened membranes. The membranes at the base of the brain were healthy, as was the brain itself.

The figure in Plate IV. presents a view of the appearance of the mucous membrane of the œsophagus and stomach. The mucous epidermis of the œsophagus (O O) is seen of a light-fawn colour, much shrivelled, quite opaque, and in many points detached from the subjacent mucous membrane.

The stomach is opened by an incision along its posterior wall, between the small and the large arch. The part of the stomach seen is the inner surface of the anterior wall entire, much charred and indurated; and portions of the posterior wall rather less charred, but still very much injured. C is the cardia, P the pylorus.

It is important to observe, that the inspection of the brain showed that this man had been labouring under chronic meningeal inflammation. The thickening of the cerebral membranes over the upper or coronal region of the hemispheres, the opaque appearance, the opaque whitish fluid which had been effused into the subarachnoid tissue, and the atrophy, or sinking and separation of the convolutions, all showed in the clearest manner that this man had been for months the subject of a chronic inflamma-

tion of the cerebral membranes, which rendered him no longer a responsible agent.

In the case now detailed of poisoning by sulphuric acid, three circumstances deserve attention ; *first*, the quantity taken ; *second*, the length of time during which the acid was allowed to act on the stomach ; and *thirdly*, the speedy fatality of the agent.

1. It is believed that at least two ounces were swallowed ; and though it must always be difficult to ascertain in cases like the present the exact amount taken, there seems good reason to believe, that the quantity could not be much below this amount. More than this he might have taken, because he had swallowed the acid privately, and he had access to it in unlimited quantity ; while in the vessel, which he had used in swallowing it, none was left. The vessel was a four-ounce gallipot, and as he must have poured the acid from the carboy, or large glass jar, into this, and as some acid was afterwards found on the floor immediately below the carboy, as if it had been spilt in pouring it from the latter, it was inferred that the gallipot must have been nearly full, if not quite full. He might, indeed, therefore, have taken three ounces of oil of vitrol.

2. The time which was allowed to elapse between the period at which the acid was swallowed, and the use of neutralizing agents, was, as nearly as could be ascertained, at least half an hour. He was seen a little before nine, performing his customary duties in the usual manner. After nine he had to descend a flight of steps, and open several doors and windows, before he could have sufficient light to get the acid ; and this must have occupied several minutes. It is inferred, therefore, that he swallowed the acid, as nearly as could be calculated, at some time between seven or eight and ten minutes past nine ; probably not later. After this period he was not observed by any one, till about twenty minutes before ten, when the attention of a young gentleman of the establishment, who had gone down stairs to one of the underground apartments, was attracted by the sound of a person breathing rather heavily, and with a peculiar noise ; and the gentleman finding him lying on the ground in an inner dark chamber, he immediately communicated to another gentleman up stairs his suspicion that some accident had happened to Maclean. The latter immediately went to the place, a dark under-ground apartment, and found Daniel Maclean lying on the right side, with his knees drawn up, his person doubled up, and his face buried in the straw, breathing heavily, and with some rattling noise, as if proceeding from a collection of mucus in the throat. His face was death-like, pale, and void of expression ; the surface was covered with a cold clammy sweat ; the pulse was slow, and almost imperceptible ; he was insensible to external impressions ; and seemed not to hear, and made no answer to questions.

This was as near as could be calculated about twenty minutes before 10, so that at this time the acid must have been acting on the stomach at least thirty minutes.

It may not be improper to state here, that he is with great probability supposed to have drank some water after swallowing the sulphuric acid; for the crane of a water pipe in the adjoining apartment was found open and the water running from it. This must have certainly increased the rapidity of the action of the acid, though that had evidently acted with great energy, and would have done so without the addition of water.

After being found in the position now mentioned, he was immediately conveyed up stairs; and, from the motion and exposure to the fresh air, he recovered some degree of sensibility and consciousness. He seemed still, however, unable or unwilling to speak, and to questions put with the view of ascertaining the cause of his present state, he merely pointed to his lips, and uttered the single word "vitriol." The lips were at this time observed to be blanched and slightly excoriated; and no doubt could be entertained from his answer, his appearance, and the fact of the gallipot being found close by the open carboy, that sulphuric acid had been swallowed. A young student of medicine, then in the establishment, immediately gave him carbonate of magnesia suspended in water, and a single draught of carbonate of lime. Soon after this he brought up by eructation and a sort of spouting motion from the stomach, some fluid, which effervesced as it fell on the floor; but this was the only approach to any thing like ejection of the contents of the stomach. And at the same time, when the epigastric region was pressed, he gave indications of great pain and internal suffering. Soon after some olive oil was administered; and the use of this was followed by great relief.

These circumstances are mentioned in order to enable the reader to judge of the great injury caused by this acid on the tissues of the stomach, both by reason of the large quantity and the time during which the acid, in its concentrated form, must have been acting on the villous membrane and other tissues of the stomach. It is next to impossible to doubt that all the mischief, as disclosed by the inspection after death, must have been accomplished during the first half hour, or even the first fifteen minutes after the acid was swallowed. This conclusion is established, *first*, by the sudden and well marked symptoms of collapse and extreme debility which had ensued, and in which he was found; *secondly*, by the circumstance of his never rallying from the state of collapse; *thirdly*, by the neutral state of the contents of the stomach discharging during life; and *fourthly*, by the appearances of the stomach, and especially its villous membrane after death.

These appearances were very characteristic as effects of the ope-

ration of a concentrated mineral acid on the animal tissues. The villous membrane was completely removed, most distinctly, indeed, over the pyloric end of the stomach, where the action of the acid was least direct, and consequently feeblest. In the anterior wall of the stomach, immediately below the cardiac aperture, the whole tissues of the stomach were, as it were, charred, and the blood in the vessels was coagulated and charred, as indicated by the black, elevated, hardened, and rough patches. On these parts the acid had acted first and most forcibly. It is difficult to say whether this was the result of the position which the man had taken shortly after swallowing the acid, namely, the right side, slightly inclined to the face, or of the acid in its descent into the stomach first touching this part in its most concentrated form. The portions to the left and to the right of this, though much and deeply charred, were less continuously so, the patches being more distinct and circumscribed, than at the anterior wall. The posterior wall was rather less charred, though it was embrowned and indurated in the same manner as the anterior portion.

3. The facts and considerations now mentioned will readily explain the sudden fatality of this case. Allowing that the acid was taken about ten minutes past nine, then the whole space intervening between that and the time of death was about three hours and a-half, certainly under four hours. This is not the shortest period occupied in the induction of death by swallowing sulphuric acid, though it is among the shortest. In one case recorded by Professor Remer of Breslaw, in *Hufeland's Journal*, death took place in the course of two hours. In the case of a boy of four years and ten months, recorded by Dr Martin Sinclair in the thirty-sixth volume of this *Journal*, (p. 102), to whom sulphuric acid was administered by his father-in-law, it appeared in evidence that the child was quite well at seven in the morning; that he was labouring under the symptoms of poisoning a little before eight; and as death took place about twelve, the interval between the administration and the fatal event was about four hours and a-half. In the case of Daniel Maclean the interval was shorter; and is intermediate between that observed in the case of Professor Remer and that observed in the case detailed by Dr Sinclair.

It is not easy to account for this rapidity in action either by the large quantity taken, or by the length of time which elapsed between the deglutition of the poison and the exhibition of antidotes. It is unfortunate that in very few cases are the two circumstances now mentioned accurately stated, and sometimes it is difficult to ascertain the exact amount taken. To illustrate these, however, and several other points, it may be useful to advert to the circumstances of several of the best recorded cases.

1. In one of the earliest cases recorded by Dr Bateman in the tenth volume of this Journal, a child, $2\frac{1}{2}$ years old, swallowed by mistake from a phial, a small quantity, as is stated, of the strong sulphuric acid, that is, it was supposed, about a teaspoonful. In this case the child survived rather more than two days, the acid having been swallowed about half-past four in the afternoon, and death having taken place at nine in the evening of the second day, making the whole space about fifty-three hours. No mention is made of the administration of antacids.*

2. In the case of a female servant, aged 19, who attempted suicide by swallowing this acid in the concentrated state, and to whom, from her concealment of the fact, no antidotes were administered till midnight of the same day, no mention is made of the quantity swallowed. As, however, the symptoms were more those of gastric inflammation than collapse and sinking, as they were sensibly mitigated on the third day, and as the patient eventually recovered completely, there is reason to believe that the quantity was small, perhaps not more, and probably rather less, than two or three drachms.†

3. In other cases the amount swallowed is equally vaguely given. Thus in a case which occurred in the practice of Dupuytren, in which a young woman of 22 attempted suicide in this manner, it is merely said that she “swallowed a glass of sulphuric acid mixed with water.”‡ No mention is made in this case of the use of antidotes, and the patient survived sixty days.

In the following case given by Lebidois, the quantity, but not the density of the acid attempted to be swallowed, is specified.

4. In the month of October 1826, a young woman, aged 22, strong, of brown complexion, and a passionate temperament, determined to swallow, in a moment of despair, three ounces of the sulphuric acid of commerce. Pain obliged her to reject the greater part of the dose, and, according to her account, only two or three spoonfuls reached the stomach. The act was followed by vomiting, convulsions, and cries, which attracted the neighbours, who endeavoured to make the patient drink cold water,—an endeavour which was impracticable, in consequence of the spasmodic constriction of the pharynx. In the evening, mucilaginous drinks, the use of milk, and the application of eight leeches over the neck were prescribed.

On the fourth day, she complained of lacerating pain deep along the course of the neck, and in the chest, from the throat to the site of the stomach,—aggravated by pressure, deglutition, cough, expectoration, speaking, and even the act of turning the head quickly. These symptoms, with vomiting whenever fluids were swallowed, epigastric pain, and rapidly advancing wasting, conti-

* Edinburgh Medical and Surgical Journal, Vol. x. p. 251.

† Horn's Archiv, 1825, May und Juni, p. 454.

‡ Clinique d'Hotel Dieu.

nued for several days, and death took place on the 7th of November, fifteen days after the poison had been swallowed.

The œsophagus was so much softened that it was torn in the attempt to divide it. Its internal surface, from the guttural to the cardiac orifice, was of a cherry-red colour, and presented in the latter region irregular whitish slips or bands, evident marks of cicatrices already formed.

The mucous membrane of the stomach, from the cardia to the pylorus, along the large arch, was traversed with large deep-red patches, covered with mucus of a wine-red colour. In several parts the epidermis is said to have been removed. The reporter understands, perhaps, the mucous membrane only. It was covered with red granulations, and appeared suppurating. In other parts, whitish, tense bands, firm, and lying in different directions, indicated the formation of cicatrices.

The lungs were also found solid, reddish, and much congested with blood in their posterior region; and the bronchial mucous membrane was of a deep-red colour, and covered with much puriform mucus.*

In this case the poison had proved fatal by inducing its secondary effects, or inflammatory reaction in the mucous membrane of the stomach.

5. In a case recorded by Carus, in which a pregnant female, nearly at the full period, poisoned herself by concentrated sulphuric acid, neither the quantity swallowed, nor the interval between deglutition and death is mentioned.†

6. In the case of Capper, recorded in this Journal by Dr Martin Sinclair, it is stated that three fluid ounces of concentrated sulphuric acid were swallowed; that their introduction into the stomach was followed by excruciating pain, retching, and violent vomiting; and that fifteen minutes after the acid was swallowed, when Dr Sinclair saw him, these symptoms were present in an aggravated form, the body of the patient being greatly bent with torture, and the retching and vomiting incessant. In this case, however, four ounces of prepared chalk diffused in a quart of milk, were swallowed in divided portions at short intervals; and it was probably owing to this early employment of an antacid antidote, that the patient survived so large a dose the long period of fifty-five hours.‡

7. In the second case detailed by Dr Sinclair, of the boy Morabin, poisoned by his father-in-law, the quantity of acid is not specified at all.§

* *Empoisonnement par l'acide sulfurique, par le Docteur Lebidois, fils. Archives Generales, Tome xiii. p. 365. Paris, 1827.*

† *Gemeins Deutsche Zeitschrift für Geburtskünde, Band ii. 1827.*

‡ *Edinburgh Medical and Surgical Journal, Vol. xxxvi. p. 99. Edin. 1831.*

§ *Ibid. p. 102. Edinburgh, 1831.*

8. Dr Roupell has given, along with a very beautiful and accurate representation of the appearances presented by the stomach after death by this acid, a short notice of the case of a young boy of $2\frac{1}{2}$ years who drank from a stone bottle a quantity of sulphuric acid, left inadvertently in a situation in which he had access to it. Carbonate of magnesia was immediately given, and afterwards Castile soap in solution; but though vomiting ensued, and acid matters with food, and then a large quantity of grumous blood, were rejected, no reaction took place; and death followed the same evening within twelve hours after the accident. In this case the quantity swallowed is not stated. But it is mentioned that, immediately after swallowing, the boy fell down on the floor, a circumstance which shows the suddenness of the action.*

9. In a case of suicidal poisoning ascertained by MM. Duvergie and Taufflieb, to have been accomplished by sulphuric acid, and in which the interval between the taking of the acid and death was forty-eight hours, no notice is taken of the quantity swallowed; and, indeed, from the manner in which the poison was taken, it was impossible to ascertain the quantity.†

10. Dr John Wilson, physician to the Middlesex Hospital, records the particulars of two interesting cases of poisoning by means of sulphuric acid. In the first of these cases, a woman swallowed, on the 3d of January 1834, it is stated, a part of twopenny worth of oil of vitriol. This she survived six months or twenty-six weeks in the first instance, and appeared to have recovered from the immediate effects of the injury. After rejecting a cylindrical shaped pseudo-membranous tube, which manifestly proceeded from the œsophagus, she made partial recovery, and left the hospital with some degree of flesh and strength. She was readmitted, however, in the following September, rather emaciated and enfeebled; and after suffering from retching and vomiting for three days previously, she expired calmly on the 17th November, after having survived the swallowing of the sulphuric acid forty-five weeks and three days.

11. In the second case recorded by Dr Wilson, a young woman swallowed at 12 o'clock midnight, on the 2d January 1836, from two to three ounces of strong sulphuric acid, which remained in the stomach for a quarter of an hour, when she vomited a black ropy fluid. She was admitted into the Middlesex Hospital at ten next morning, unable to speak except in a whisper, unable to open the mouth, from which issued ropy mucus; with great tenderness from the pharynx down to the epigastrium; the pulse scarcely to be felt; the extremities cold, and ejection of every fluid as soon

* Illustrations of the Effects of Poisons. By George Leith Roupell, M. D. London, 1833.

† Annales D' Hygiene, No. xxvi. T. vii. Paris, 1835.

as it was taken ; while she frequently vomited a fluid of the consistence of treacle, and the colour of carbonate of iron. She died the same night at twelve, having survived the deglutition of the acid exactly twenty-four hours.*

In the latter case it is remarkable that life was continued so long after the time at which the acid was taken, considering the quantity swallowed. No mention is made of any antidotes having been employed ; and from the period at which the acid was taken, it is likely that nothing could have been done for several hours.

Dr Wilson's first case is in many respects very valuable, but in none more than in showing how long, under certain circumstances, a person may survive so frightful an injury, and the state of the stomach that is left by the secondary effects of the poison. It is rare, indeed, that an individual survives so long as Dr Wilson's patient did ; for either death speedily takes place, or recovery, more or less complete, ensues. I have met with only one case altogether similar, which fell under the observation of Dr Friz of Markgroningen.

12. A large strong man, aged 45 years, who spent a debauched life, and was much addicted to drunkenness, having eaten an abundant meal of boiled potatoes, at 11 o'clock in the forenoon, on the 1st of April 1837, drank shortly after, in a fit of *taedium vitæ*, at once, one ounce and a half of concentrated sulphuric acid. The violent burning in the gullet thence induced obliged him to confess his act, and to solicit assistance. The use of sweet milk, and afterwards of oil, was followed by copious vomiting, in which the potatoes were rejected of a black colour. When Dr Friz saw him about five hours after, the patient had taken some magnesia suspended in water, but refused to continue the use of the remedy, lay speechless, giving indications of intense burning in the œsophagus ; had, on account of the great thirst, drank, notwithstanding the difficulty in swallowing, much beer, and appeared to have vomited with the potatoes a good deal of sulphuric acid. He took some subcarbonate of potass in solution every quarter of an hour. The complexion was at this time pale ; the pulse incapable of being counted ; and the face, at the angles of the mouth, and the parts touched by the vomited matters, presented deep impressions on the skin, as if from tight cords, but without excoriation or change in colour.

Next day, 2d of April, there were violent pains in the abdomen, and oil, yolk of eggs, and carbonate of magnesia, were given. On the 3d, the patient could speak a little, and complained of burning pain in the mouth and stomach, and colicky pains.

* Medico-Chirurgical Transactions, Vol. xxi. p. 272. London, 1838.

From this time onward to the 3d and 5th of May, or for a whole month, the case presented symptoms of inflammation of the mouth, throat, œsophagus, and stomach ; and these were opposed or alleviated by various measures. The most constant symptom appears to have been difficulty in swallowing, pain in attempting it, and indication of constriction of the œsophagus. Under the use of remedies, he was so much improved in the month of July, that the patient believed the use of medicine no longer necessary. In August, symptoms of obstruction of the œsophagus again appeared, and increased towards the end of the month, with emaciation and hectic fever ; and death took place on the 30th of September.

Dissection disclosed various lesions. The lungs were occupied by tubercles, and the pleuræ adhered. The stomach contained some yellowish fluid ; and the villous membrane was only a little inflamed, not destroyed. The œsophagus was in the middle remarkably contracted for the space of half an inch, and on its posterior part presented an opening half an inch long into a blind sac.*

In this case, the interval amounted to the long space of 182 days or 26 weeks exactly, being the same time as the first period during which the patient of Dr Wilson survived.

In this case it is scarcely possible to doubt that the principal reason why the patient survived so long was, that less injury was done to the stomach than usual ; and that the reason of this was, that the acid was swallowed when the stomach had been previously filled with alimentary articles, which assuredly prevented the acid from acting so energetically on the gastric tissues as it would otherwise have done.

Dr Ebers of Breslau again details two cases in which, after sulphuric acid was taken in some quantity, the patients recovered.

13. In the first case, a young woman of 22, swallowed on the 7th November 1836, a tablespoonful of oil of vitriol. The usual symptoms ensued, followed by shivering and the symptoms of inflammation of the stomach. To subdue these, blood was drawn from the arm, leeches were applied to the epigastric region and neck, subcarbonate of potass was administered, and oleaginous emulsions were given ; on the third day sensible relief ensued ; and the patient left the hospital well on the 1st of December.†

14. In another case by the same author, a woman of 29 swallowed a quantity of sulphuric acid which could not be ascertained ; and was immediately conveyed to the hospital. The act was followed by agitation, violent fever, and vomiting of bloody and blackish mucous matters. For these symptoms the solution of subcar-

* *Medizinisches Correspondenzblatt des Wurtembergischen Ärztlichen Vereins.* Jahrgang, 1838. Band viii. No. 27.

† *Rust's Magazin*, Band 1. Heft iii. 1837.

bonate of potass was prescribed and continued for four days with great and marked alleviation ; and ten days after, on the 24th of July, the patient left the hospital quite recovered.*

Dr Michaelsen of Meldorf, in South Dithmarsch, records in Pfaff's *Practical and Critical Communications*, two cases of this accident which occurred in his practice in the year 1837.

15. In the first case, a young woman, who was dismissed from service for some petty theft, took it so much to heart that she resolved to destroy herself; and with this intention, drank from a small phial on the 9th of July, a quantity of the glacial vitriol of Nordhausen. The quantity was not easily ascertained ; but Dr Michaelsen conjectures that it was probably half an ounce. Her father, who suspected some evil, poured milk down her throat, but, as no improvement followed, he called a physician next day. The fact was concealed for two days ; and on the third the physician discovered the truth. Mucilaginous and oily remedies were exhibited ; but much pain was felt in the epigastric region and belly in general. On the morning of the 14th day she had spent a bad night with abdominal pain ; at three in the afternoon the slightest touch could not be borne ; the face was hippocratic ; and the whole surface covered with cold clammy sweat. Leeches and other means produced no alleviation ; and three hours after, viz. six in the evening, the patient expired. It is here not very clearly stated whether this catastrophe took place on the 14th day of July, the fifth after taking the acid, or on the fourteenth day after taking the acid.

On inspecting the body the most important circumstances disclosed were the following. A quantity of offensive gas issued from the abdomen ; and the peritoneal cavity contained fluid so acrid as to smart the fingers, and corrode the instruments used in dissection. The stomach, which contained a thickish brown fluid, was everywhere corroded and perforated, and so putrid in its coats that it gave way and tore on the slightest touching. The omentum and the ileum were also softened and lacerated in patches ; the colon in a less degree. The liver, spleen, and kidneys were in appearance natural. The uterus was in its virgin state.

The contents of the stomach, and the organ itself subjected to chemical experiment, showed that it contained sulphuric acid.

In this case, though the quantity swallowed was not large, yet the long time during which the acid in its concentrated state was allowed to act on the stomach, must have amply compensated in the effects produced or the deficiency in quantity. It is unfortunate that it is not distinctly stated whether the patient died on the 14th day of the month, that is, the fifth day after swallowing the acid, or on the fourteenth day after the acid was swallowed.

* Rust's Magazin, Band 1. Heft. iii. 1837.

I am inclined to think from the account of the case, that death took place on the fifth day.*

16. In the second case which occurred to Dr Michaelsen, a married woman, the wife of a prosperous merchant, who was accused of having stolen certain articles of dress, and was in consequence threatened with a judicial examination, and had also been reproached by her husband, swallowed, with the intention of self-destruction, about 11 o'clock forenoon, on the 6th September 1837, about one ounce of concentrated sulphuric acid, but concealed what she did till evening, when it was first understood after a physician had been summoned, by her having repeated offensive tar-like stools. She was seen in bed at eight in the evening, nine hours after swallowing the acid; and presented the usual symptoms; the face and limbs cold, the lips, tongue, palate, and gums white, as if scorched; speech scarcely perceptible, and the pulse small and hard but not frequent. She complained of pain in the back, and a sense of heavy uneasiness in the epigastric region, and could not swallow. She was ordered three drachms of potass in water, decoction of salep with prepared oyster shells, (carbonate of lime,) and oat-gruel with calcined magnesia suspended in it for drink. Next day, when the surface was warm, leeches were applied over the throat, poultices of linseed and henbane over the belly; an enema of olive oil and milk was administered; and internally oily emulsions were given. At twelve at noon the patient could neither speak nor swallow; at one she had the aspect of speedy death; and at two she was lifeless. The interval was in this case twenty-seven hours.

The mouth with its soft parts, the pharynx and œsophagus, were stripped of their epidermis, of a whitish-gray colour, and mortified, and the teeth were eroded. Upon opening the chest, which discharged a large quantity of very offensive gas, the lungs appeared compressed by the diaphragm, turgid, with black semifluid blood, of a black-gray colour, and mortified in certain places; the heart flaccid and soft, distended with air, filled with blood partly coagulated, partly semifluid.

In the cavity of the abdomen, from which also much fetid gas was emitted, the stomach and duodenum appeared partially mortified; the jejunum, in its whole extent, marked with inflammatory redness, but not mortified; and the ileum and the colon in the natural state. The liver was unusually empty of blood, and somewhat degenerated. The urinary bladder and kidneys were sound. The blood-vessels of the abdomen were almost all empty; the peritoneum not reddened, and the uterus converted into a

* C. H. Pfaff's *Practische und Critische Mittheilungen aus dem Gebiete der Medizin, Chirurgie und Pharmacie*, redigirt von Dr J. Samson, in Altona. Neue Folge. Vierten Jahrgangs, 9 Heft. S. 64, 78.

scirrhus mass, without trace of cavity or orifice. No trace of sulphuric acid was discovered in the stomach and course of the intestinal canal on chemical examination.*

Dr Michaelsen thinks it important to observe, that in the first case, the sulphuric acid was drunk from a medicine phial with a long narrow neck, so that the cavity of the mouth was less affected, but more must have reached the stomach; whereas in the second case, according to the nature of the vessel employed, the opposite state might take place.

Amidst so many fatal consequences from the deglutition of small quantities of sulphuric acid, it is interesting, if not extraordinary, to perceive a case of recovery after the deglutition of two ounces. Of this an example occurred to Dr Beeskow in Drossen.

17. A young woman of 18, took on the 22d November 1837, about two ounces of concentrated sulphuric acid in order to poison herself. The usual symptoms ensued. The treatment consisted in the exhibition of milk and oil in abundance, the application of leeches, sinapisms, and afterwards the administration of calcined magnesia, and to counteract constipation, castor oil and Epsom salts. After eighteen days, the patient was completely restored, and remained so, without *sequelæ* or deformity, excepting a small scar on the lower lip. †

18. Dr Lowenhardt of Prenzlau met with the following case of suicidal poisoning in 1833. A man, aged 53, who had been labouring under symptoms of obstruction of the portal system, and indigestion, in a fit of hypochondriacal gloom, early on the 17th of August, drank out a small bottlefull of concentrated sulphuric acid, which, however, he instantly repented, and speedily sent for Dr Lowenhardt. The latter found the tongue greatly swelled and covered with a white shrivelled membrane, and the mucous membrane of the mouth in the same state; yet the patient was capable of swallowing moderately well. He complained of violent pains in the throat, in the œsophagus, and in the stomach; and violent hiccup and vomiting were combined with cold extremities, &c. Alkaline solutions, milk, and mucilaginous remedies were administered; but everything was rejected. General blood-letting and bleeding by leeches were equally unavailing; and the patient expired at half-past two in the afternoon, with all the symptoms of most acute gastric inflammation.

Dissection disclosed the marks of inflammation of the epiglottis, inflammation and gangrene of the œsophagus and stomach; and slighter marks of lesion in the small intestines.

In this case, the exact hour at which the acid was swallowed,

* C. H. Pfaff's Practische und Critische Mittheilungen, u. s. w.

† Medizinische Zeitung-Herausgegeben von dem Verein für Heilkunde in Preussen, 1838. No. 43.

is not specified ; and it is merely stated that it was taken early in the day ; nor is the quantity mentioned, or even attempted to be estimated. The interval between poisoning and death was probably not more than seven or eight hours.

19. In another case by the same author, a robust dyer, addicted to intoxication, drank on the 11th of October 1836, by mistake from a bottle, some concentrated sulphuric acid, which he instantly spat out. He took at the same time, much solution of soap with milk and cold water ; but, notwithstanding the use of these means, the interior of the mouth was almost everywhere swelled and partially stripped of its mucous membrane ; and so violent were the marks of reaction that general blood-letting, and afterwards local bleeding by leeches were prescribed for the violent inflammation in the throat. Two days after, on the 13th, the patient was better, and fever much alleviated ; and he complained merely of the mouth and throat, for which leeches were again applied. On the 21st, the tongue was found adherent to the lower jaw, and the velum to the tonsils. The fauces appeared to be still movable, but the patient complained of difficulty in swallowing solids. This was ascertained to depend on inflammatory thickening and contraction of the œsophagus, which increased, as the patient refused to have the elastic tube daily introduced into the œsophagus. The patient endeavoured to obviate this annoyance by the use of brandy, and thereby brought on *delirium tremens* in the summer of 1837.*

These cases, which constitute the greater number of those recorded, I mention to show not only how vaguely often the quantity of acid taken, and the interval between its introduction into the stomach and death, are mentioned, but also to show how different are the effects of the acid in different circumstances.

Some importance it seems reasonable to attach to the circumstance of the acid being taken when the stomach is either empty or nearly empty. Dr Sinclair states, that in the case of the patient John Capper, the acid was taken while the stomach was void of solid food. In the case of Daniel Maclean, it was swallowed previous to his having taken breakfast, and consequently when the stomach was as nearly as may be empty. In all the other cases, excepting that by Dr Friz, the circumstance is not noticed. But from the circumstances under which the acid was taken, and the period of the day at which it was swallowed, there is reason to believe that more or less food was contained in the stomach at the time. It is not improbable that this may account in some degree for the great disparity in the effects produced in different cases.

From the comparative view now given of the facts afforded by

* *Medizinische Zeitung*. Herausgegeben von dem Verein für Heilkunde in Preussen, viii. Jahrgang, 1839. No. 8.

these cases, which may be regarded as the most suitable for the purpose, it seems to result as a natural conclusion, that the degree of speed, with which sulphuric acid destroys, depends on the three circumstances of the quantity taken, the interval allowed to elapse before antidotes are used, and the circumstance of the stomach containing solid food or not, which might be interposed between the acid and the villous membrane of the stomach, and thus enfeeble, or at least retard the violence of its action.

The appearances presented by the parts touched by the acid, as well as by those not touched by it, show that it induces a most complicated sort of lesion. The charring of the different tissues of the stomach, and especially of the blood in the blood-vessels nearest the action of the acid, and the coagulation of that blood, is perhaps the primary and most essential lesion. At the same time, other lesions not less pernicious and destructive take place.

The acid seems to be a very short time in the stomach when it not only chars the villous membrane of that organ, but is absorbed or transudes through the textures, and affects the serous membranes, all of which give proofs more or less distinct of acid reaction. Thus, in the case recorded in this paper, the peritoneum and the fluid contained in it gave instantly to litmus-paper decided marks of acid reaction; and in a less marked degree the thoracic serous membranes gave proofs of the same condition. It is to be observed, that the fluid discharged from the stomach during life was quite neutral; and it must accordingly be inferred that the acid had exuded, or transuded, or been conveyed to the serous membranes during life. If this conclusion be admitted as legitimate, it is very probable that the speedy and great degree of collapse, often so great as to be irrecoverable, is the result of the acid affecting the surface of the serous membranes. This conclusion seems so much more natural, when the general fact of the speedy action of poisons applied to any of the serous membranes is remembered, and when the violent and well-marked lesion of the constitution, in consequence of sudden injurious impressions on any of these membranes, is kept in view.

Besides the lesion now mentioned, there is another which deserves especial attention, not only for its influence on the manner and certainty of the fatal event; but from the peculiar part which it performs among the symptoms during life. The effect of the acid on the mucous epidermis of the œsophagus has been observed by all who have witnessed the appearances left after death by this poison. Though its application to the membrane can be almost only instantaneous, yet its action is conspicuous and intense. It renders the epidermis quite opaque, shrivelled, or contracted into folds, and detaches it from the subjacent mucous corion. The epidermis is then rendered so much more distinct, that its exact termination at the car-

diac or lower end of the œsophagus is most evidently visible ; and even the fringed-like or denticulated mode of termination at that part may in some measure be recognized. At the upper or pharyngeal end, and in the pharynx itself, this indurating, shrivelling, and decorticating process is still more distinct. The mucous epidermis over the pharynx and the epiglottis, the lateral regions of the epiglottis, and over the top of the larynx, suffers often in a most serious degree in the deglutition of concentrated sulphuric acid. The mucous epidermis may be, as it was in the instance now mentioned, detached and elevated in the form of vesications, while, if life be sufficiently prolonged, inflammation of the epiglottis and glottis ensues. The injury, in short, inflicted at the upper part of the larynx by the deglutition of sulphuric acid is quite analogous to, or identical with, that which has been shown by Dr Marshall Hall and Mr Stanley, to take place in the same parts, in consequence of the attempt to swallow boiling water from the spout of a tea-kettle. This, it is known, acts so violently on the epidermis of the throat as to vesicate the epiglottis and glottis, and induce speedy death, with all the symptoms of violent *laryngitis* or *œdema glottidis*. In the case detailed in this notice all these effects were produced ; and they had induced not only the difficult and noisy breathing presented by the patient when first found, but the peculiar gasping depression of the lower jaw, which continued to the last breath. The symptoms of gasping motion or depression of the lower jaw, during the spasmodic attempts at inspiration, is always observed in severe and intense cases of laryngeal inflammation ; and its presence in the case now mentioned was readily traced to the state of the laryngeal epidermis found after death.

In the foregoing review of cases of poisoning by swallowing sulphuric acid, it is remarkable how rare an occurrence is corrosion of the stomach, and solution and perforation of its tissues. The case in which it was most distinctly observed, is that detailed in the preceding paper by Mr Watson, in which the whole of the lower portion of the organ was dissolved and hanging in loose shreds, so as to leave a large aperture communicating with the peritoneal cavity. In one other case only did any approach to this state take place, viz. that of the young woman seen by Dr Michaelsen of Meldorf ; and in whom this corrosion and softness of the gastric tissues seemed to be the result of the long time, viz. two days, during which the true nature of the accident was concealed.

Of all the other cases the general result is to show, that the deglutition of sulphuric acid, in any considerable quantity, is followed by two kinds of symptoms. The first are those of the immediate effects of the introduction of the acid into the stomach. These are, deadly weakness, coldness of the surface, weakness and tenu-

ity of the pulse, laborious but very feeble respiration, loss of voice, amounting to aphonia, and even insensibility and unconsciousness. Vomiting may or may not take place. These symptoms may continue two, three, four, or even eight hours, and terminate fatally without the slightest marks of reaction, as it is named. From the facts furnished by all the cases of this kind, and the appearances found in the dead body, it is impossible to doubt that these symptoms are the result of the immediate injurious operation of the acid on the villous membrane of the stomach, its blood-vessels, and also on the peritonæum.

When this action is not sufficiently violent and intense to induce death, it is followed, after a period variable in different cases, by symptoms of reaction. The surface and extremities become warm; the pulse becomes fuller and frequent; the patient complains of pain in the epigastric region, and sometimes over the whole abdomen, which is aggravated by pressure; pain also in the neck, and often along the whole course of the œsophagus; difficult deglutition; vomiting; hiccup; hoarseness and difficult breathing; in short, all the symptoms of inflammation of the throat, larynx, œsophagus and stomach. If these symptoms are not very intense, and if they are promptly subdued, recovery takes place; but if they be violent, or if they be neglected, the inflammation, suppuration, and ulceration of the œsophagus and stomach, prove fatal by their influence on deglutition and digestion, by preventing nutrition, and thereby undermining the general strength.

Regarding the treatment of this accident, it should be accommodated to the two orders of symptoms now mentioned.

Immediately after the acid is swallowed chemical considerations suggest the instant use of antacids, as the alkalies and alkaline earths; and in general this practice has been adopted. In the case detailed above, it was employed freely by means of magnesia and chalk. The latter has been recommended, on the ground that it has a stronger affinity for sulphuric acid than magnesia, and because, being more easily miscible with liquids, it can be administered in greater quantity in a shorter time. At the same time magnesia presents such facility of union with the acid, and is so convenient in forming a soluble salt, that it seems here entitled to preference. Carbonate of soda also is a very excellent antacid, and whenever accessible ought to be given. Foreign physicians are much in the habit of prescribing carbonate or subcarbonate of potash; and that also is entitled to attention preferably to chalk. Upon the same principle, solutions of soap have been employed; but they must always act with less power than either magnesia or either of the alkaline carbonates.

But, however plausible be the doctrine which recommends the immediate use of the antacid or saturating alkalies and earths, it may be doubted whether they are very efficacious in preventing or

stopping the destructive action of the sulphuric acid. The action of this acid upon animal matters is so immediate, and its energy in developing their carbonaceous matter is so powerful, that, in the majority of cases, the destruction of the parts touched is completed. The only means of obviating or enfeebling this action upon the stomach is, by substituting other articles upon which the acid may perform the same action which it does, and must inevitably do, upon the stomach. It is an important fact well deserving attention, that most of the means recommended and employed to neutralize the acid do not appear to obviate or prevent its destructive effects; and, conversely, in a number of cases in which either other substances were present in the stomach at the time, or were speedily introduced, less destruction has been perpetrated than where the alkaline earths or mineral bases have been used. Thus, in several of the cases, in which milk has been copiously exhibited soon after the deglutition of the acid, the patient survived the immediate operation of the acid, reaction took place, and either death was the result of the secondary inflammatory action, or recovery ensued.

These facts and considerations would lead to the conclusion, that the best method of treating the immediate symptoms of poisoning by the exhibition of sulphuric acid, consists in the administration of milk, containing large quantities of magnesia, or the carbonate of soda or potass, and the liberal use of mucilaginous drinks, with gruel, and the vegetable decoctions. If the patient survive this stage, and if symptoms of pharyngeal, laryngeal, œsophageal, or gastric, or peritoneal inflammation ensue, the next best remedies are, blood-letting from the system, local bleeding from the neck and the epigastric region, by means of leeches, the use of opiates pretty freely, the use of mucilaginous fluids and milk, and counter irritation by means of blisters, sinapisms, and the rubefacients, and epispastics over the epigastric and umbilical region.

The bowels should be kept open, not by medicines administered by the mouth, but by enemata.

I cannot conclude this notice without saying that I am much indebted to my clerk, Dr Roberts, for his judgment and promptitude in administering the means of relief.

20. Since concluding the foregoing remarks, I have received from Dr Patrick Newbigging, the gentleman who was called to Maclean, the following account of a case in which a young child was poisoned by sulphuric acid, survived the primary effects, and died of the secondary consequences.

“I was summoned, on the morning of the 18th of March 1838, to see a female child, aged 17 months, who had swallowed some sulphuric acid used for cleaning brass.

She appeared to be in great suffering, the mouth being open,

and the tongue projecting. I administered some carbonate of magnesia in milk, of which she drank freely, causing much eructation, and followed with relief, and, in about an hour from the time she had swallowed the acid, she fell asleep.

She had vomiting of a dark-coloured fluid in the evening, with some return of uneasiness in the epigastrium. A desert-spoonful of castor oil was administered, with four drops of the solution of morphia. On the 19th, I found she had passed a good night, but on awaking she complained of pain in the region of the stomach, occurring in paroxysms, with much tenderness on pressure over that part. The pulse was 130 ; the tongue coated. The discharges from the bowels were of a dark colour. A couple of leeches were applied to the epigastrium, and some oil was administered. On the following day (20th) she was quite free from pain, and was moving about the house. The bowels were open, and the discharges were of a dark colour.

After giving some suggestions in regard to diet and general management, I left her in charge of her own medical friend.

I was requested to visit her on the 28th, and found her collapsed ; the pulse scarcely to be felt ; the eyes sunk ; the pupils dilated ; and almost insensible to light. I learnt that, in consequence of the improvement which had gone on since the 20th, the friends had been induced to give her soups, and other stimulant diet, which was followed with gastric pain, vomiting, and the usual symptoms of mucous inflammation.

She died early on the morning of the 29th.

I regret that the friends could not be prevailed upon to grant an examination of the body."

